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IS 54 (1988): Green oxide of chromium for paints [CHD 20: Paints, Varnishes and Related Products]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR
GREEN OXIDE OF CHROMIUM FOR PAINTS

(Second Revision)

1. Scope — Prescribes the requirements and methods of sampling and test for green oxide of chromium pigment used in paints and allied industries.

2. Terminology — For the purpose of this standard, the definitions given under 2 of IS : 33-1976 'Methods of sampling and test for inorganic pigments and extenders for paints (second revision)' and IS : 1303-1983 'Glossary of terms relating to paints (second revision)' shall apply.

3. Requirements

3.1 Form and Condition — The material shall be in form of dry powder free from grit, or in such a condition that it can be readily reduced to the powder form by crushing under a palette-knife without any grinding action.

3.2 Lead-free Material — When lead-free material is required, it shall contain not more than 0.03 percent of lead or compounds of lead (calculated as metallic lead) when tested by the method specified under 24 of IS : 33-1976.

3.3 The material shall also conform to the requirements prescribed in Table 1.

4. Packing and Marking

4.1 Packing — The material shall be suitably packed as agreed to between the purchaser and the manufacturer.

4.2 Marking — The containers shall be marked with the following information:

- a) Name of the material;
- b) Manufacturer's name or his recognized trade-mark, if any;
- c) Mass of the material;
- d) Batch No. or lot No. in code or otherwise; and
- e) Month and year of manufacture.

4.2.1 Standard marking — Details available with the Bureau of Indian Standards.

5. Sampling

5.1 Representative samples of the material shall be drawn as prescribed under 4 of IS : 33-1976.

5.2 Criteria for Conformity — A lot shall be declared as conforming to this standard if all the test results on the composite test sample satisfy the requirements prescribed under 3.

6. Quality of Reagents

6.1 Unless specified otherwise, pure chemicals and distilled water [see IS : 1077-1970 'Specification for water for general laboratory use (second revision)'] shall be employed in tests.

Note — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

Adopted 10 May 1988

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TABLE 1 REQUIREMENTS FOR GREEN OXIDE OF CHROMIUM FOR PAINTS
(Clause 3.3)

Sl No.	Characteristic	Requirement	Method of Test Ref to	
			Appendix	CL No. in IS : 33-1976
(1)	(2)	(3)	(4)	(5)
i)	Chromium content, expressed as Cr_2O_3 , percent by mass, <i>Min</i>	97.0	A	—
ii)	Volatile matter at $105 \pm 2^\circ\text{C}$, percent by mass, <i>Max</i>	0.3	—	7
iii)	Loss on ignition at $1\,000 \pm 20^\circ\text{C}$, percent by mass, <i>Max</i>	1.0	B	—
iv)	Residue on sieve (63 microns), percent by mass, <i>Max</i>	0.5	—	8
v)	Oil absorption	Within ± 10 percent of the approved sample	—	9
vi)	Colour	Close match to the approved sample	—	10
vii)	Staining power and tone	Close match to the approved sample	—	11
viii)	Matter soluble in hot water, percent by mass, <i>Max</i>	0.2	—	17.1
ix)	pH of the aqueous extract	± 1 pH unit of the approved sample	—	19.1
x)	Resistance to alkali and acid	Not inferior to the approved sample	C	—

APPENDIX A

[Table 1, Item (i)]

DETERMINATION OF CHROMIUM CONTENT

A-1. Outline of the Method — Chromium oxide is estimated by converting it to chromate and titrating with potassium permanganate solution after allowing the chromate to react with a known excess of ferrous ammonium sulphate solution.

A-2. Reagents

A-2.1 Ferrous Ammonium Sulphate Solution (0.1 N) — Dissolve about 40 g of ferrous ammonium sulphate crystals in 950 ml of water and add 50 ml of concentrated sulphuric acid (r.d. 1.84).

A-2.2 Standard Potassium Permanganate Solution (0.1 N) — Dissolve about 3.2 g of pure potassium permanganate (KMnO_4) in 1 000 ml of water, allow it to stand for 8 to 14 days and siphon off the clear solution into a glass stoppered bottle, painted black. Standardize it as described in A-2.2.1.

A-2.2.1 Weigh accurately about 0.25 g of pure potassium dichromate crystals and dissolve in about 300 ml of water. Add 20 ml of sulphuric acid (1 : 1 by volume), 100 ml of ferrous ammonium sulphate solution and 5 ml of syrupy phosphoric acid and titrate with potassium permanganate solution, noting the volume when the last drop of potassium permanganate solution leaves a permanent pink tinge. Titrate with potassium permanganate solution, a fresh quantity of 100 ml of ferrous ammonium sulphate solution acidified with sulphuric acid and diluted with water as before for blank.

A-2.2.2 Potassium dichromate equivalent of 1 ml of potassium permanganate solution is $\frac{m}{y-x}$ g, where x and y are volumes in ml of potassium permanganate solution required in the first and second titrations respectively, and m is the mass in g of potassium dichromate crystals.

A-2.3 Sodium Peroxide

A-2.4 Sulphuric Acid — See IS : 266-1977 'Specification for sulphuric acid (second revision)'.

A-2.5 Phosphoric Acid — See IS : 798-1986 'Specification for ortho-phosphoric acid (second revision)'.

A-3. Procedure — Make an intimate mixture of about 0.1 g of the sample, dried at $105 \pm 2^\circ\text{C}$ as described under 7 of IS : 33-1976 and accurately weigh, with 5 g of sodium peroxide in a silver or nickel crucible. Fuse the mixture over a gas flame, keeping the molten mass at low red heat for 5 minutes. Tap the partly cooled fusion cake on to a plate, dissolve it in 200 ml of warm water in a covered beaker. Rinse the crucible with warm water and transfer the rinsings to the beaker. Add 1 g of sodium peroxide and boil the solution vigorously until the peroxide is completely destroyed. Cool and acidify with about 30 ml of sulphuric acid. Add 5 ml of phosphoric acid (r.d. 1.7) and make up the solution to about 500 ml in a 800 ml beaker. Add exactly 100 ml of ferrous ammonium sulphate solution with vigorous stirring. A deep green colour develops when reduction is complete. Titrate the excess of ferrous ammonium sulphate solution with standard potassium permanganate solution, taking the first faint darkening of the clear green colour as the end point. Run a blank, starting from peroxide fusion in the same manner and at the same time. Note the volumes of potassium permanganate solution required in both cases.

A-4. Calculation

$$\text{Chromium oxide, percent by mass} = \frac{50.67 a (V_1 - V_2)}{M}$$

where

a = potassium dichromate equivalent of 1 ml potassium permanganate solution, as found in A-2.2.2;

V_1 = volume in ml of potassium permanganate solution required for blank titration;

V_2 = volume in ml of potassium permanganate solution required for the titration with the sample; and

M = mass in g of the material taken for the test.

APPENDIX B

[Table 1, Item (iii)]

DETERMINATION OF LOSS ON IGNITION

B-1. Outline of the Method — The determination of loss on ignition is generally carried out in order to determine physically or chemically bound water. Discoloration, as a result of ignition, generally indicates the presence of small amounts of organic substances in chrome pigments.

B-2. Apparatus

B-2.1 Muffle Furnace — Capable of being maintained at temperature of $1\,000 \pm 20^\circ\text{C}$.

B-2.2 Platinum Crucible

B-3. Procedure

B-3.1 Weigh about 5 g of the pigment, to the nearest 0.1 mg into the platinum crucible that has previously been heated at $1\,000 \pm 20^\circ\text{C}$ for 15 minutes cooled and weighed. Heat the crucible in the furnace at $1\,000 \pm 20^\circ\text{C}$ for 15 minutes. Repeat ignition and cooling to obtain constant mass.

B-4. Calculation

$$\text{Loss on ignition, percent by mass} = \frac{M_1}{M} \times 100$$

where

M = mass in g of the material taken for the test, and

M_1 = loss in mass in g on ignition.

APPENDIX C

[Table 1, Item (x)]

TEST FOR RESISTANCE TO ALKALI AND ACID

C-1. Outline of the Method — The determination of resistance to alkali and acid is the measure of degree of bleeding or change of colour from the approved sample.

C-2. Reagents

C-2.1 Dilute Hydrochloric Acid Solution (1 : 4) — Dilute 20 ml of hydrochloric acid [see IS : 265-1976 'Specification for hydrochloric acid (*second revision*)'] to 100 ml with water.

C-2.2 Dilute Sodium Hydroxide Solution (20 percent) — Dissolve 200 g in 1 000 ml water [see IS : 376-1986 'Specification for sodium hydroxide, analytical reagent (*third revision*)'].

C-3. Procedure

C-3.1 Shake about 2 g of the sample in a test tube with a convenient volume of dilute hydrochloric acid solution. Allow to stand for 1 hour. Treat the approved sample at the same time in the same manner. Note any difference of colour change in the suspensions of the pigments. Repeat the test on a fresh test portion using the dilute sodium hydroxide solution in place of dilute hydrochloric acid solution and again note any difference of colour in the suspensions of the pigments and report the change in colour, if any.

EXPLANATORY NOTE

This standard was originally published in 1950 and was revised in 1975, incorporating additional requirements for pH value, resistance to acid and alkali; and modified the oil absorption requirement. Subsequently, the International Organization for Standardization (ISO) brought out ISO 4621-1986 'Chrome oxide green pigments — Specifications and methods of test'. The Committee responsible for the preparation of this standard decided to align it with the ISO standard.

In this revision, the limits for volatile matter and matter soluble in hot water; test methods for determination of resistance to alkali and acid have been modified. New requirement for loss on ignition has been added and pH value has now been prescribed as ± 1 pH unit of the approved sample instead of giving the pH range. The limit of lead for lead free material has been reduced from 0.05 to 0.03 percent.